COST AND MANAGEMENT

PROFIT

Measurement of Return on Capital Employed by Profit Centres . . .

By F. J. Muth

Income Analysis for Multiple Product Industries . . .

By Lee L. Keener

Integrated Data Processing . . .

A Panel Discussion

LOSS

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Jan. 1957

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Cost and Management

VOL. XXXI JANUARY No. 1

MEASUREMENT OF RETURN ON CAPITAL EMPLOYED BY PROFIT CENTERS

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Mr. Muth is Assistant Controller of the Armstrong Cork Company in Lancaster, Pennsylvania, and has been with this Company since he graduated in Business Administration from Cornell University. A frequent contributor to the Controller, the publications of the American Management Association, and the N.A.C.A. Bulletin, Mr. Muth has also addressed various management groups throughout the country on the subject of the accountant's part in cost control and cost reduction programmes.

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Mr. Keener, Treasurer of B. F. Goodrich, Canada Ltd., has been with that firm since 1940, handling various accounting, auditing and credit assignments. A native of Alliance, Ohio, he is a graduate in Business Administration from the University of Arizona. Coming to Canada in 1954, he became Treasurer of the Canadian Company. He is a past president of the Cleveland Institute of Internal Auditors and a member of the Canadian Manufacturers Association.

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Editorial Comment . . .

BUSINESS — 1957

Traditionally this is the time of the year when editors and columnists sit down before the crystal ball and proceed to prophesy.

What really significant things will happen in Canada in 1957?

There is the usual wide selection of topics about which predictions could be made. For example: It is an election year. What is the future of the various political parties? Or what fringe groups will combine to form a strong opposition? Probably the most exciting field of conjecture, however, and that which affects most of us, is the state of business.

Viewed in retrospect, 1956 was another big year in every way. The Gross National Product was close to 30 billion, representing a jump of ten per cent in each of the past two years. Employment figures show that 5,800,000 people had jobs and by year's end, only 150,000 or between two and three per cent of the populace were looking for work. For comparative purposes in a free enterprise system this is, in effect, full employment. Labour income was 14.2 billion compared to the previous year's income of 12.8.

Judging by these figures Canada and Canadians enjoyed a prosperity unknown before.

Will this continue in 1957?

Let us look at the G.N.P. In 1956 about 25% of this figure was based on capital spending, which is therefore a significant factor for 1957. Domestic capital investment will be maintained during part of 1957 due to the large amount of money appropriated in 1956 and not yet spent.

It should be remembered, however, that investment is traditionally the most volatile of all decisions and whether it will continue to support the economy as heavily for all of 1957 is a moot point.

Plant and facilities have been expanded and improved rapidly. It may be that a breathing spell will take place while industry consolidates its position in 1957 by taking advantage of the productivity created through new plant and equipment. The Government could stimulate this type of expansion by reducing the Corporation Tax. However, since the objective of current monetary policy is to restrain intended investment rather than stimulate it, there is little likelihood of deliberate tax concessions to stimulate investment.

Further rounds of wage increases will be sought this year by all the major unions, which will result in higher incomes and should support higher spending for consumer goods and services. Unfortunately, this will push up the cost of goods if it is not matched with

greater productivity. In this respect credit restrictions introduced in 1956 will have a more decided effect on certain types of spending in 1957.

Housing, mainly affected by tight money will be down to 100,000 units compared to 125,000 in this last year. However, a six per cent growth is predicted for the economy as a whole, four per cent stemming from increased productivity and two per cent from a rise in prices.

Our labour picture demonstrates that we have been pretty well producing to the limit and in certain areas there is clearly a shortage of manpower.

One very encouraging fact in the 1956 picture has been the relative independence of the Canadian Economy. For generations we have been fearful of the effect of recession and inflations in the United States. The capital and productive strength of the Canadian Economy was not impaired last year however by outside influences to any extent. For example: The drop off in U.S. automotive sales and production did not find a counterpart in Canada.

There is one factor which could upset the 1957 Canadian picture rather seriously and that is a worsening of the International Scene. If we must begin a further heavy programme of military spending, the economy will undergo severe strain. Production facilities now used for consumer goods will be turned to military goods. Shortages will arise, controls on buying will emerge again and generally inflationary pressure will increase.

The net result of this entire story is that business activity will continue at a high level and probably increase, but the rate of increase will be less. Our upswinging economy has been heavily dependent on a high and rising rate of capital investment, both domestic and foreign. Higher and higher construction and machine costs and increasing difficulties in securing funds owing to credit restrictions and the using up of funds provided by depreciation, make it unlikely that this phase will continue at such a high level.

All in all, if no International crises develop the picture is a happy one. The economy is sound and vigorous. A few stimulants such as more people and increased productivity would materially strengthen an already booming business scene.

One machine can do the work of fifty ordinary men. No machine can do the work of one extraordinary man.

—Elbert Hubbard.

C. & M. Round-Up . . .

By N. R. Barfoot

LOOKING AHEAD

Antibiotics as food preservatives is the latest use for the wonder Drugs. Aureomycen can be used to bring a major reduction in fish spoilage costs due to transportation to markets.

—o—o—

New futures in Wood—Laminated beams are definitely competitive with steel or concrete. They currently run about 10% less in cost and can be made as strong.

—o—o—

The Consumer Market is still vast. Of Canada's 3.9 million homes, 95% don't have a freezer, 72% don't have an electric sewing machine, 57% don't have an electric stove, 61% don't have T.V., 48% don't have a vacuum cleaner, 25% don't have an electric refrigerator and 2% don't have a power washer.

—o—o—

Canada—biggest Atom Power Producer—is the latest possibility. We are the biggest producers of natural uranium. We will have the first nuclear power station in operation (Des Joachims, Ontario) in the Western Hemisphere using natural uranium as a fuel. Canadian electrical manufacturing giants and construction companies are getting early experience in design and construction of such plants.

—o—o—

GENERALLY SPEAKING

1957

Business getting better in 1957 is executive view. The recent survey by Western University's School of Business Administration reveals more confidence ahead than at this time last year.

Higher prices were predicted.

75% of individual firms expected increases in business, 17% expected the same business.

Employment increase was expected by 52½% and 41% expected continuance at the same level.

Wage and salary increases are expected by over 90%, all in all it looks like another and even better boom year for Canadian Industry.

Coffee Breaks

A fifteen minute coffee break twice daily for one year costs you $105.00 for one employee at $35.00 per week and $300.00 if the pay is $100.00 per week.

For an office of ten employees, this lost time is worth $1,050.00 and $3000.00 per annum for the pay brackets mentioned.

We never think about idle capacity in the office. Estimate the break period cost in your office—You will be surprised.

Air Power

Aviation is a $400 million dollar manufacturing business in Canada. It ranks eighth largest in terms of sales.

Expects to lead by 1981.

As far as the carriers are concerned:

Tonnages are up by 25% in 1956

Over 2 million passengers have been carried, over twice as many as in 1950.

—o—o—

Clerical Help

It is estimated that clerical help is in a ratio of 1-8 to the total number gainfully employed.

If the trend continues in another decade or so it will be 1-4. Hence automation in the office must come as quickly as possible.

However, automation in the factory is proceeding at such a pace and in its development, such mountains of paper work are generated that ratios really don't mean anything.

The important thing is productivity in the office as well as in the shop. Ratios can become a snare and a delusion.

—o—o—

N.E.S.

National Selective Service obtained 1,000,000 jobs for people in 1956. This is from a start in 1941 of 336,000.

68% of all urban and 33% of rural employees now use National Selective Service.

In addition to files on those out of work there is a reservoir of persons now employed who want better jobs.

N.E.S. is 7,000 strong—many of them University Graduates, and is Canada wide.

N.E.S. Placement Service is particularly useful for the many small Canadian businesses unable to have personnel officers of their own.

—o—o—

ON THE PERSONAL SIDE

Housing in short supply—say the experts. Despite a ten year programme of 100,000 per annum, there are still about 400,000 needed. Main causes are: fast wear out of pre-war houses and material: population increase which is using up new homes as fast as they can be built.

—o—o—

Huge sales of "Tranquilizer" pills—have alarmed Government authorities. Extensive tests and research are on to get some answers as to whether they are habit forming and dangerous to health or if they have any real effect.

—o—o—

I'll take it to the highest court in the land". This phrase, at least in Canada, is strictly academic in most cases. You can't take any case to the Supreme Court unless $10,000.00 or the public interest is involved. So don't threaten to take a $25.00 Traffic Violation to Ottawa.

—o—o—

10,000 Canadians now belong to investment clubs. As a matter of fact they are nearly as big a factor in the investment market as the major Life Insurance companies. The standard investment is $10.00 per month per person.

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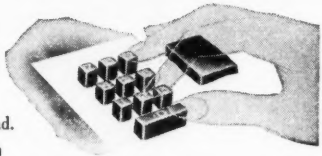

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Measurement of Return on Capital Employed by Profit Centres . . . *

By F. J. MUTH,
Assistant Controller,
Armstrong Cork Co.,
Lancaster, Penn.

Ascertaining return on capital invested is essential to sound policy decisions in such matters as make or buy, introduction or deletion of product lines and capital expenditures. An approach to the use of this valuable internal management tool is outlined below.

APPROXIMATELY twenty-five years ago the du Pont Company adopted return on capital employed as the single measure of the managerial efficiency of their several units. The theory received considerable publicity, and many industrial management groups journeyed to their offices to discuss the merits of this internal management tool. However, very few actually adopted it at that time.

In the reconstruction period following World War II, with its surprisingly rapid expansion of facilities to service built-up demands of the consumer, industrial leaders awoke to the fact that inflation had changed the ratio of investment to sales, commonly referred to as turnover. Not only had the cost of buildings and machinery shown an amazing increase but the financial requirements of inventories, receivables, and operating cash of the expanded operations were found on projection to equal the sums needed for fixed assets. In fact, many businessmen became painfully aware that, as a general rule, a dollar of investment in fixed assets automatically set up a need for a dollar to be invested in current assets. As most companies turned to the equity markets to raise the funds needed for expansion, it became increasingly obvious that potential earnings should be measured against capital employed rather than sales. New interest was shown in the theory of return on capital employed. Turnover had become as significant as profit on sales in testing the economics of proposed moves. As a result, the past five years have seen continuing growth in the number of companies who have accepted return on capital employed as the true measure of performance.

The R.O.C.E. Theory

By capital employed, we mean the total assets of a business. It is the figure shown at the bottom of the left-hand side of the balance sheet. Where these assets come from is not important. Generally, they are supplied by the stockholders in the form of original investment and profits reinvested in the business, by vendor in the form of accounts payable, by accrued taxes or long-term debt. We are interested in how well these funds, required for operations, are put to use as measured by the returns. The term "capital employed" should not be confused

*An address presented at the 15th Ontario Conference, Society of Industrial and Cost Accountants, October 18 and 19, 1956.

with net worth or stockholders' equity. The relationship of return to net worth is also of interest, but from a financial standpoint rather than a test of how well management employs the funds made available to them.

The formula for return on capital employed is simply per cent profit on sales times turnover. For example, if a company produces a profit of $10,000 on $100,000 sales volume and employs $50,000 in capital, it has a 10% profit on sales and has two turns of capital. The return on capital is 10% × 2 or 20%. Obviously, we get the same answer if we relate the profit dollars to the capital employed, but if we did this we would lose sight of two important factors, the relationship of cost of sales to sales income and the relationship of capital employed to sales volume. These two factors must be kept under constant surveillance if we are going to be successful in managing our businesses.

The return on capital employed can be improved in three ways:

1. By increasing sales income through increased prices of volume.
2. By decreasing costs.
3. By reduction in capital employed through improvement in inventory levels, speeding up collection of accounts receivable, putting excess cash to use, and economic control of capital additions.

The first step in contemplation of adoption of the return on capital employed measurement as an internal management tool is the development of historical information of total company results for the past ten years. This should be detailed to show sales, capital employed, turnover, per cent profit (after tax) on sales, and finally, return on capital employed or R.O.C.E. These facts alone stimulate management to further questions as the trends in turnover, per cent profit on sales, and R.O.C.E. become apparent. These questions become translated into answers as to the indicated actions required for correction of adverse trends or further improvement in satisfactory trends. For example, a down-trend in turnover suggests the need for improvement in sales volume; deterioration of the per cent profit on sales may call for reduction in factory costs. Obviously, these steps call for detailed analysis. The examination of sales income includes both price levels and quality of product versus competition. If these appear to be in line, more intensive sales effort is indicated. Increased volumes will, of course, lower costs, but, in addition, a searching review should be made of labour, material, scrap, and expense to uncover the possibility of further savings.

Comparisons of total company results should next be made with companies recognized as competitors and also with companies recognized by financial analysis as being representative of the leading industrial management groups. This latter group would contain such

names as General Motors, du Pont, Kennecott Copper, Union Carbide and Carbon, Continental Oil, General Electric, and Deere and Company, to mention just a few of those who have been successful over the years in maintaining a consistently satisfactory return on capital.

In making these comparisons, study the operating and balance sheet ratios to determine how well your management is doing against the field. It may be that comparative turnover figures developed for both current and fixed assets may bring to light the fact that your company investments could sustain a far larger volume of business if credit policies and inventory controls and capital additions are more carefully administered.

Determination of Capital Employed

These are only a few ideas as to how the use of R.O.C.E. for internal management purposes leads on to improved performance. Once each echelon of your organization has become interested in making its contribution toward reversing or improving the trend, many other avenues leading to this goal will be found. As accountants, be prepared to receive an immediate request for a breakdown of the total capital employed to divisions and product groups. At first, this breakdown appears to be a formidable task, but, properly delegated throughout the accounting staff with adequate explanation of the desired end result, a first distribution can be established in a surprisingly short time. This distribution will be subject to correction in succeeding months as the allocations of such portions of capital which are employed in common by two or more products are improved through actual experience. You will encounter considerable argument from those in positions of responsibility as to your selection of bases for allocation, but this intense interest should be viewed as encouraging rather than discouraging. You will know that you are accomplishing what you set out to do, that is, to make the various management heads aware of the importance of turnover. As agreements are reached on the soundness of your approach, the degree of questioning will subside and managers will turn to the more important task of finding the means leading to improvement in turnover. Through this breakdown total company return on capital to individual divisional and product returns, you will be disclosing the strong, the average, and the weak commodities so that effective steps can be taken to strengthen the overall company results. With these goals in mind, the accountant must stand ready to supply the required breakdowns on logical bases which will reflect the economic functions of the specific assets.

Before proceeding with the breakdown, those assets of a general company nature which are not applicable to divisions and products should be deleted, for example, cash in excess of operating requirements, investments in other companies, and subsidiaries whose earnings are not consolidated with the parent company. Since such capital has

no relation to the division or product results, obviously it would be unfair to assign it at these levels. Following such deletions, we are ready to proceed with the allocations. General rules which might be used are as follows:

The ebb and flow of cash is related to the demand for fixed assets, changes in inventory levels, and accounts receivable, as influenced by fluctuation in sales volumes. Requirements for cash to finance operations are, therefore, to be related to cost of sales, including tax. A review of past experience and the opinion of your treasurer will be helpful in determining a sound percentage to apply. In our company, we have elected to use 7½% of the cost of sales figure. Although the majority of our products are manufactured, warehoused and distributed, we do handle a fair amount of jobbed items. Some of these are warehoused before distribution; others we merely order the manufacturer to ship directly to our customer. Through careful study, we have arrived at agreement to apply 2½% of cost of sales for the manufacturing function, 2½% for warehousing, and 2½% for distribution, or a total of 7½% for items manufactured, warehoused, and sold. Jobbed items warehoused and sold are assigned 5%; the jobbed items sold direct from the manufacturer's stock 2½%.

The portion of capital employed represented by customers' notes of accounts receivable should be assigned to product lines on the ratio of receivables to sales dollars. These ratios can be established by determining the average credit period for each division and product as indicated by the terms of sale. Sundry accounts receivable are generally found to be related directly to a specific product group. If they should be of a general nature, allocation should be made on the basis of sales dollars.

Inventory values should be taken as net after valuation reserves used to reflect the lower of cost or market, LIFO, or any other basis used for balance sheet purpose. This net value is used because profits are effective when the valuation reserves are established, and operations cannot be expected to absorb these adjustments and still be measured against unadjusted figures. Raw material inventories should be analyzed, and those materials used in only one product should be carried directly to it. Raw materials used by two or more products are allocated on relative current usage. The same principles apply to work in process which is not moved to a point where it can be identified with a specific product group. All other work in process and all finished stock should be specifically charged to a product. Supplies, maintenance, and other indirect materials should be allocated according to usage by first distributing them to operations, and then from operations to the product processed therein. For example, coal would follow steam usage to operations, and then by allocation to the relative activity in each operation.

Depreciated values are used for property, plant and equipment as in the case of inventory valuations. Depreciation costs have already been applied to operations, and it would be unfair to use the original cost basis. Depreciation values should be determined by operations. Service operations may be allocated to productive operations on the basis of service rendered at normal or long-term average activity levels. The total of each productive operation and its share of operations may be allocated to products on the relative normal or long-term activity within the operation. For fixed assets, normal activity should be used as the distribution basis rather than current or forecast activity. This is distributed because fixed assets are acquired in relation to normal requirements, and not in relation to any temporary high or low product activity level. Proper ratios to determine normal requirements should be available in the factory expense standard record.

Intangible assets represent a portion of the capital employed and, therefore, need to be allocated if used for a patent or license that pertains to a specific product. If they are of a general nature, they can be assigned on the basis of sales dollars. Prepaid expenses need to be analyzed and each item allocated according to its ultimate charge to expense.

Assigning Profit Responsibility

Adoption of the R.O.C.E. theory of management must be preceded by reexamination of the organizational structure to determine that profit responsibilities are clearly spelled out. In this process it must be borne in mind that the return on capital employed measurement of efficiency is valid only to the point of profit responsibility. Once this point is passed, team play enters the picture, with all members of the team aware that their individual moves are aimed at the ultimate goal of increasing the return. For the individual team members, however, other forms of measurement must be used. For example, the sales responsibility which does not include factory costs can be measured by volume, style lines, and price trends, as well as trends in distribution, selling, and advertising costs. And production performance should be studied, not only on the basis of unit costs, but on the basis of such physical measurements as labour hours, formulation, scrap allowance, and quality improvement.

While it is common practice in a large company to maintain an organization chart, it is a rare thing to find that the responsibility for profit has been spelled out and assigned to specific individuals. The sales manager knows that he is expected to sell in such volume as to utilize the factory capacity. The production manager understands that he is expected to schedule and produce so as to serve these sales adequately. Both are expected to operate in such a fashion as to produce a profit. If the responsibility for profit has not been placed,

failure to operate profitably is usually explained by the sales manager as the fault of the factory; the quality is poor, the scheduling is bad (resulting in unsatisfactory deliveries), or factory costs are too high. The factory manager claims that the sales manager has failed to sell the expected volumes, he concentrates on unprofitable items, the sales mixture and order size make efficient production impossible, or there is unreasonable insistance on breaking into established production schedules in order to meet customers' demands.

This throwing of blame for failure back and forth over the fence which divides these two areas of operation will cease only when top management appoints as arbiter an individual in whom, at the same time, it places responsibility for profit. In making this move, the selected individual should be advised of the capital employed in his area of responsibility, the level of return on investment which the management regards as satisfactory for the present, and the goal in return toward which operations are to be directed. This individual must understand, first, that his performance under this responsibility will be measured by his sucess in attaining the established goals and, second, that his compensation will be commensurate with his performance. Once stated, this policy must be adhered to rigidly. Deviations from the established goals of return on investment cannot be explained away on the basis of all the untoward happenings encountered during the year. It is expected that the individual selected to fill the position of profit responsibility will evidence the capacity to surmount the difficult and stay on the agreed-upon course.

Setting Profit Goals

Having set the organizational structure and having assigned profit responsibility for the production and sales of all products falling within a market area, it is next necessary to set the goals in return—both short and long-range. These individual goals should be set by the president's office, with the agreement of the respective market area managers, through an evaluation of past performance and future potential. The goals must recognize that approaches to improvement in return will necessarily vary for different market areas. As a guide for management planning, we have found it helpful to classify all products in three categories: (1) those earning a relatively high return, (2) those earning a modest return, and (3) those earning an unsatisfactory return or showing a loss.

Obviously, the objective in dealing with commodities in Category 1 is to play to strength, to increase the share of the company's business that is done in these profitable enterprises. This is implemented by striving to increase sales volume through special sales effort, advertising and promotion, and investment for increased productive capacity where it can be sold. These commodities receive intensive research to

develop new uses and markets. They also are studied to analyze characteristics which can possibly be matched in other commodities to promote the development of companion products or other items serving the same or similar markets.

Items in Category 2 are studied to seek ways by which they might be moved into the more profitable Category 1 through some combination of the following approaches:

1. Cost reduction.
2. Sales pressure for increased volume.
3. Higher sales prices.
4. Reduction in capital employed through reduced inventory of finished goods, goods in process and raw materials, simplification of product lines, obsolescence of unnecessary equipment, etc.
5. Elimination of the least profitable items, especially loss items, if any, within the commodity or product line.

Any commodity or product group in Category 3 is a drag on the company, since it represents capital and effort that do not provide an adequate return to insure future strength, stability, and growth; therefore, all products in Category 3 are kept under close scrutiny in an attempt to achieve, as promptly as possible, either a satisfactory rate of profit or elimination of the commodity.

In the rapidly moving economy of our country, based on tremendous research programmes, it is axiomatic that new developments will outdate our present lines. Accordingly, we must keep a constant watch for signs of obsolescence of our current manufacture and be prepared to slough off the old and adopt the new. As obsolescence creeps in, profit margins recede. If we fail to recognize obsolescence, we tend to invest more and more capital to improve factory costs or to stimulate distribution. Eventually we become locked in by the sheer size of the investment and the cost of getting out. At this point we encounter not only reduced profits but, more seriously, the dilution of managerial effort. The commodity in question becomes a drag on the company as a whole. For products which are becoming obsolete, we need to plan an orderly retreat. This retreat must be more rapid than the projected decline of the market for the product if we are to avoid the problems of being in business during its demise when orders are scattered and irregular and, therefore, unprofitable. It is important to concentrate our capital and talents on those items which are profitable and avoid the dissipation of effort on low-return commodities for which little or no hope of improvement can be foreseen.

This breakdown of products into three categories not only serves as a guide to day-to-day management thinking and planning but also

provides a sound basis for establishing priorities and measuring decisions on new capital investment. If the basic objective is to be met, all new capital investment for maintenance, replacement, or additional facilities must be related to the objective.

Keying Investment to the R.O.C.E. Theory

An aggressive growth company usually finds that the total of projects for capital investment conceived or proposed by the various members of the business substantially exceeds the funds available from depreciation or retained earnings. On occasion, it is necessary to resort to outside financing to take advantage of highly profitable opportunities. If such new capital is to be acquired on a favorable basis, it is important that the maximum results be obtained from the current investment. Accordingly, the total of all projects presented for inclusion in the capital additions budget receives a careful screening to weed out those which bear no promise of maintaining or improving the return on investment. To assist in accomplishing this, the proposals are recorded in two major groups as follows:

1. Investments which are required to maintain satisfactory operations on existing products and which normally do not increase the earning power of fixed assets. These include.
   a. Rebuilding and replacement of existing facilities.
   b. Projects for general plant improvement.
   c. Projects for safety, health, and working conditions.

Since projects in this group do not add directly to earning power, they should be held to a level consistent with good plant administration so that the major share of the available capital can be used for projects expected to improve the rate of earnings.

2. Investments made to increase the company's earning power in both existing and new products. These include projects for:
   a. Cost reduction.
   b. Quality improvement.
   c. Additional capacity in existing products.
   d. Manufacture of new products.

Investment in this group can be justified only on the ground that they will improve the company's rate of return, except in those cases where the expenditures are clearly required to maintain the existing rate of return of a commodity which is producing or gives real promise of producing satisfactory results.

Cost reduction projects are to be approved only when the calculated savings after tax indicate an attractive return. Examination must be made, not only of the potential return on the new capital, but also the return on the total capital employed by the commodity both before and after the new investment to avoid adding capital to an operation which gives no promise of a satisfactory return.

Profit possibilities of quality improvements projects are more difficult to evaluate. These need an objective appraisal as to whether the project will assist in maintaining or improving the present rate of return, and again the current return must be examined in reaching decisions.

Projects involving additional capacity of existing commodities are to be checked, first, as to the present profit level and, second, as to whether profitable sale of the increased capacity is assured over a business cycle. Investments made to satisfy peak demand of a year or two can seldom be substantiated and threaten to leave us with heavy investment in excess capacity facilities.

Recommendations for investment to produce new products must be supported by thorough economic analyses based on adequate sales research to determine whether there will be a sustained demand for the product. Assurance that the projected rate of return can be achieved should be especially clear before the appropriation is made, as entrance into new fields of endeavour is usually accompanied by considerable risk.

This cursory review of the categories of capital appropriation emphasizing the importance of evaluating each proposal in the light of the basic goal of return on investment as established by management. Avoidance of such realistic appraisal of proposals for capital expenditures not only constitutes a major block in attaining the long-range objective but may well be the cause of serious deterioration of earning power which may take years to correct.

This approach automatically sets up a need for post-evaluation of completed projects to ascertain whether the economic projections which supported the appropriations have become realities. The existance of such a check keeps the engineers, sales, and production managers within practical limits when developing the data for the economic analyses on which executive decision is to be based. Semi-annual reviews of the status of capital appropriations should, therefore, be made to the president's office. These reviews compare actual experience with the forecast data of such points as the following:

1. Completion date.
2. Cost of project.
3. Return on investment.

The return on investment check is made in detail against the original study several months after completion of the facility. If the objective has been met, the item is approved or removed from the next report. If not, it is given further study for ways and means of reaching the objective and is continued on the report until successful or until it is agreed that it must be classified as a failure. Post-evaluation of capital appropriations is an effective means of keeping the organization

aware of the importance of consistency in executive action under the R.O.C.E. method of management.

Case Study

With this background of the development and application of the return on capital employed theory, we are ready to turn to Exhibit A, an illustration of a case study of a commodity which was supplying only a modest return on the capital employed, even though it was being produced and sold on a capacity basis.

In Column 1 we see that the annual sales were forecast at $2,750,000. Capital was being turned 1.49 times against a profit after tax of 6%, producing a return on capital of 8.9%. Obviously, something needed to be done to bring this return to a satisfactory level, particularly since demand for this commodity was such that it supported capacity production. Reference to the Per Cent of Sales section of Column 1 showed that material accounted for 33.6% of the total net sales dollar. This appeared to be the most lucrative field in which to accomplish cost reduction. The first approach was to re-examine the formula to ascertain whether the current quality can be maintained with slight changes in the ingredients to lower the cost of raw materials; the next, to examine the handling and storage costs of raw materials. At the same time, the Purchasing Department examined the economics or order volumes to ascertain whether better prices might be had from the existing or competitive suppliers and to see whether savings might be made in arranging for delivery in bulk or less expensive containers.

Through these approaches, material cost was reduced by 10%, and the proportionate percentage of the sales dollar to 30.2%. This change diminished the cash requirement for financing this product through application of the formula of 7½% cost of sales to $160,000 in place of $170,000. Also, the inventory values dropped to $250,000 in place of $270,000. This reduction in capital employed against the same level of sales income lifted turnover from 1.49 to 1.52. Since the profit on sales had been increased to 7.6%, the return was now at a level of 11.6%.

This accomplished, labour, scrap, direct and period expense elements were reviewed. The approach to reduction of these costs was in the nature of a reexamination of standard allowances. A careful review of labour allowance developed the possibility of increased production per direct labour through the addition of incentives and the elimination of down-time by better scheduling of production runs. Scrap standards were carefully studied to uncover the reasons for scrap loss. A programme was developed to alert the production group as to the possibility of reduction of this cost through taking the steps necessary to correct what had possibly been accepted over the years as an inevitability. A review of period costs unveiled the possibility

EXHIBIT A
COMMODITY "A"—PLANT "B"

	(1) 1956 Budget		(2) Same as (1) Showing Effect of 10% Cost Reduction on Material		(3) Same as (2) Showing Effect of Additional cost Reduction: 5% on Labour, 25% on Scrap, and 15% on Period Expense		(4) Same as (3) Showing Effect of a 10% Increase in Production and Sales	
	Amount (000)	% of Sales	Amount (000)	% of Sales	Amount (000)	% of Sales	Amount (000)	% of Sales
Net Sales Dollars	$2,750	100.0%	$2,750	100.0%	$2,750	100.0%	$3,025	100.0%
Direct Cost of Sales:								
Material	925	33.6	832	30.2	832	30.2	915	30.2
Labour	207	7.6	207	7.6	197	7.2	217	7.2
Scrap	90	3.3	90	3.3	67	2.5	74	2.4
Direct Expense	100	3.6	100	3.6	95	3.4	105	3.5
Total Direct Cost of Sales	1,322	48.1	1,229	44.7	1,191	43.3	1,311	43.3
Manufacturing Period Expense	742	27.0	742	27.0	631	22.9	631	20.9
Total Mfg. Cost	2,064	75.1	1,971	71.7	1,822	66.2	1,942	64.2
Selling & Adm. Expense	342	12.4	342	12.4	342	12.5	342	11.3
Total Costs	2,406	87.5	2,313	84.1	2,164	78.7	2,284	75.5
Profit before Tax	344	12.5	437	15.9	586	21.3	741	24.5
Federal Income Taxes @ 52%	179	6.5	227	8.3	305	11.1	385	12.7
Profit after Tax	165	6.0	210	7.6	281	10.2	356	11.8
Capital Employed & Turnover	$1,840	1.49	$1,810	1.52	$1,790	1.54	$1,844	1.64
Return on Capital Employed	6.0% x 1.49 = 8.9%		7.6% x 1.52 = 11.6%		10.2% x 1.54 = 15.7%		11.8% x 1.64 = 19.4%	
Capital Employed (on an Annual Basis)								
Cash	$ 170		$ 160		$ 150		$ 160	
Accounts Receivable	200		200		200		220	
Inventories	270		250		240		264	
Property Plant & Equipment	1,200		1,200		1,200		1,200	
Total	1,840		1,810		1,790		1,844	

of reducing maintenance and indirect labour charges through the establishment of tighter controls. This study was successful in reducing the direct labour by 5%, scrap by 25%, and period expense by 15%. Accordingly, the profit on sales increased to 10.2%. Capital employed in the cash and inventory elements was further reduced, turnover speeded a few points higher to 1.54%, and the return on capital to 15.7%. The efficiencies reflected in Column 3 removed bottlenecks and increased the capacity of these operations so it was now possible to produce to service a sales volume of $3,025,000 in place of the former level of $2,750,000. The sales manager was contacted to put forth increased effort to move this additional volume. This was done without increasing the selling and administrative expense, and accordingly the profit on sales moved up to 11.8%. The turnover of capital was now at a level of 1.64%, and the return on capital employed 19.4%. In summary, the R.O.C.E. was improved from the original 8.9% to 19.4% and Commodity A was lifted from what was considered a modest return to a satisfactory return.

The cumulative effect of detailed application of the return on capital employed theory to profit centers is obvious. Once established, this approach becomes a growing and dynamic stimulus toward improved operations. By keeping the profit motive before the entire management group, it discourages intuitive decision and emphasizes the importance of meeting the over-all objectives of the business. It is for these reasons that industry is so rapidly accepting return on capital employed as the true measurement of managerial effectiveness.

DISCUSSION

In considering the questions submitted, it should be re-emphasized that the R.O.C.E. tool is for internal management purposes and should be studied for trends in return, rather than level of return for a specific year. Since it is an internal management tool, it can be tailored by an individual company to suit the general philosophy of its management.

Question: Should fixed assets for R.O.C.E. be valued at gross, net or replacement value?

Answer: Capital employed is defined as the total of the assets used in the business, net of reserves. It is the figure shown at the bottom of the left-hand side of the standard balance sheet. Assets are netted of reserves since profits are affected by the building of the reserves. If original costs were used, it would then appear logical that the cost of establishing the reserves should be added back to profits. Since we are interested in trend, the bases for profit and investment are best kept in the simplest possible approach toward gathering the comparative data of competitive and well-managed companies. To use original value would fail to recognize the decrease in efficiency of assets with the passing of time, which is one of the major functions of the depre-

ciation charge. To attempt to use replacement value through the application of indices brings confusion and imponderables into the picture. Accelerated depreciations allowed by different Government concepts admittedly bring some dislocations into comparisons. If these are major, possibly special consideration may be given through adjustments to normal depreciation rates if management so desires. However, accounting exercises should be avoided unless management feels they are absolutely necessary.

Question: Please explain a little more the difference in concept of return on capital employed vs., return on investment, i.e. Net Worth.

Answer: The return on capital employed tool measures the effectiveness with which management employs the total funds made available to it regardless of source, i.e., stockholders' investment, vendors (accounts payable), accrued taxes or funded debt. This capital employed figure supplies a common base or denominator and eliminates the confusion which might arise from attempting to use a net equity figure, since companies accumulate the funds they are using in their businesses in different ways. Return on investment is a figure of interest to security analysts as it shows earnings in relation to the stockholders' equity. The use of this figure, however, is for financial purposes and is removed from the immediate management picture.

Question: If in the case of an unsatisfactory R.O.C.E. product or process, an increase in investment as for example a new machine is not sufficient to make the product or process as a whole a satisfactory one, but is in itself highly profitable, what would the decision be?

Answer: This is a management decision. It must be recognized that a commodity producing an unsatisfactory return is a drag on the company, since it represents capital and effort that do not provide an adequate return to insure future strength and growth. Investments such as the one described can be dangerous unless it is expected that the commodity in question can be brought into the satisfactory-return level.

Question: Due to inflationary trends of assets purchased to-day as opposed to costs of 20 years ago, varying degrees result in obsolescence of different machines, how can equity be best maintained as to the capital invested for different lines?

Answer: It is not feasible to attempt to recognize inflation trends of to-day as opposed to costs of twenty years ago. Certainly, the machinery of to-day versus that acquired twenty years ago has a greatly-improved efficiency and should develop materials at lower cost than is possible on antiquated equipment. In other words, the relationship of higher profits to higher investment should show an improved return versus the relationship of low profits to low investment.

Question: What would you consider a satisfactory R.O.C.E. ratio for a manufacturing operation of durable consumer goods?

Answer: Probably the best source to determine a satisfactory R.O.C.E. ratio for the manufacturing operation of durable consumer goods would be reference to the results obtained by the outstanding companies in these lines. The following tabulation is an example:

R.O.C.E. DATA FOR DURABLE GOODS PRODUCERS

		1953	1954	1955	Mid-Year 1956
1.	Phelps Dodge	11.4	11.7	18.5	24.1
2.	Kennecott Copper	12.2	10.5	16.5	22.5
3.	General Motors	14.2	16.9	20.7	15.9
4.	Caterpillar Tractor	7.9	9.6	11.6	15.6
5.	General Electric	10.1	12.5	11.8	13.1
6.	Eastman Kodak	9.9	12.9	14.7	12.7
7.	I.B.M.	7.2	8.6	9.4	10.1
8.	Deere & Company	5.7	4.8	6.4	3.7
9.	Chrysler	8.3	1.9[1]	8.3	2.7
10.	Westinghouse Electric	6.0	6.5	(3.3)[2]	(1.8)[2]
	Total of These Ten Durable Goods Companies	10.9	12.1	14.9	12.5
	Total of All U.S. Manufacturing Companies employing over $100,000,000 in Assets	7.7	7.8	9.6	9.0

[1] Bad model year
[2] Strike

Question: Do you calculate R.O.C.E. by department within a profit centre? If so, on what basis do you determine the portion of profit which applies to a department?

Answer: R.O.C.E. is not calculated by department within a profit centre. It is applicable only to the point of profit responsibility which would include responsibility for sales and production. It is sometimes interesting to show the profit results of individual factories by accumulating the sales and profits of the commodities produced therein. However, it is not fair to measure the effectiveness of a plant manager on a R.O.C.E. basis, since he cannot control sales volume, sales prices, or sales mixture.

Question: In column 2 of the chart, Inventories are reduced to $250,000 from $270,000 in column 1. Does the figure of $250,000 result from any formula applied, or was it arrived at by scrutiny of what inventory would be actually required in view of the material cost reduction?

Answer: The figure of $250,000 in Column 2 of the chart, showing a reduction from $270,000, was arrived at by scrutiny of what the inventory value would actually be in view of the material cost reduction.

Question: I see where capital employed can be allocated to product lines. I get the idea that you feel they can be allocated to sales division, manufacturing division or finance division. Is my understanding correct and if so could you develop the method used a little more?

Answer: Capital employed can be allocated to product lines as stated. It can also be allocated to sales division or manufacturing division through accumulation of sales, profits, and investments required by the product lines handled by the particular sales division or manufacturing division. The finance division is assigned such investment as is not required by the operating units of the company, for example: cash in excess of that required for operations or permanent investments in stocks or bonds.

Question: How far down the line should responsibility for profit be delegated? Should all participants share in savings based on accomplished performance?

Answer: To repeat, responsibility for profit cannot be much beyond the divisional level. The divisional manager, in turn, should have the authority to recognize the degree to which people reporting to him should share in the savings or increased profits resulting from performance of the division.

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Income Analysis for Multiple Product Industries . . .

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Success in a multiple product industry depends on early analysis of the profitability of individual items. Some of the accounting tools which play a vital role in income analysis are described in the following paper.

THIS PAPER deals with income analysis in a multiple product industry. My own company, B. F. Goodrich, produces 32,000 different rubber products. We are definitely a multiple product company, just as the entire rubber industry is multiple product. There appears to be a firm trend towards more multiple product industries, and the accompanying accounting problems, are to say the least—multiple.

Accountingwise, the compasses we use to chart our course to financial success are such tools as margin sheets, detailed forecasts, pay out periods, and return on capital employed. First of all, and one of the most important tools at our disposal, are margin sheets.

Margin Sheets

As we use the term, a margin sheet is a statistical report of income or loss, both by unit and annual volume, of a series of related but individual products. The margin sheet plays a vital role in the control and operation of our business. In our multi-product line, we find it necessary to prepare the margin sheets of the various product divisions in several forms, although we are now studying the problem of establishing a uniform report. Briefly, the margin sheet contains:

1. Standards used as a base.
2. Product description.
3. Weight of product or units.
4. Selling value per unit.
5. Net sales value.
6. Mill door cost (plus period cost).
7. Selling and general administration expense.
8. Operating income (related to net sales).
9. Total sales and income where the annual unit volume is available.

Margin sheets have proved of inestimable value to us in determining profitability by individual products, individual lines, and by specific departments and sales divisions.

*An address presented at the 15th Ontario Conference of The Society of Industrial and Cost Accountants, October 18 and 19, 1956.

We prepare them in sufficient categories to determine income margins by various classes of trade, and by customer when the variety of products sold makes this desirable. All product lines are covered and all volume items individually computed. We should like to cover each of the thousands of items in various sizes that we manufacture, but some are of such minor volume that the actual magnitude of the job makes the attendant expense a major barrier. Nevertheless, approximately 90% of our sales dollars are supported by margin sheets.

Distribution is made to each of our senior officers, to our sales division managers, and to our product committees, which will be described a little later.

By their nature, these reports, which are really sales and income statements by individual product, pinpoint trouble areas of high cost or insufficient selling price, and develop areas of attack where our people may work most effectively to combat the trouble spot. Price and discount structures, distribution methods, packaging, and manufacturing costs have been studied easily by individual items, and the results in some trouble areas have proved the effectiveness of the reports. They have served to deny some cherished wishful thinking that existed in our organization; in one sales division, they were the direct cause of eliminating excessive packaging and distribution costs, and have been a contributing factor in a number of cost reduction moves in our production departments.

Normally, we give annual coverage to every line, with occasional interim "flash" sheets in periods of rapidly changing costs.

Available Funds Study

We prepare, three times annually, a detailed sales and income forecast known to us as an available funds study. This study is an excellent guide to the profitability and retention or expansion of product items and lines. To take advantage of all opportunities for expansion to keep our share of Canada's growing markets, we must be able to forecast our sales volumes and income, at least over a short term.

This is becoming increasingly difficult to do as Canada's economy spirals upward. All the recent estimates of the Canadian potential have been proved conservative and even government planning has not been prepared for the record surpluses which are now expected. We believe that 1957 will see the Canadian gross national product soar to 31 billion. The increasing demand for all types of goods and services will, we believe, continue throughout 1957 and we are basing our forward planning on this vigorous outlook. We can look forward to a rise of 4 per cent in general business growth and capital investment in Canada is expected to be at a higher ratio than the U.S. The current low figures on unemployment in Canada are welcome but they also

place a limitation on our growth as they indicate a shrinking labour supply. This labour market will likely remain tight for three more years, but the situation should improve considerably by 1965. It is apparent though, that Canada needs a larger population in order to secure a firm domestic market for our production. Although there will be some soft spots in our future growth, we are assured that our standards of living will continue to rise and our immense capital outlay of nearly 10 billion in 1956 will reap handsome dividends.

New developments in technology, product research, education and industrial growth will continue the spirit of the "dynamic fifties" a long way into the future. There are two areas which could be troublesome and could hinder our growth. In the first half of this year, the availability of funds increased somewhat less rapidly than the demand. Our credit restrictions and increased interest rates on loans are a burden to many businesses and individuals which would like to have greater access to lending facilities. Chartered banks, at the request of the Bank of Canada, have agreed to cut down long term loans . . . which last year reached 400 million on large loans to companies that could and should have floated securities to get the money.

The publicity about American investment in Canada, has done one good service for us and that is the loosening of Canadian investment funds. But still further progress is needed and demanded if our upward climb is to continue. The other possible trouble area is the influx of low-labour cost goods from foreign areas. This tidal wave of merchandise points up all the more clearly why we need a more solid domestic market for our produce. When the foreign goods take away jobs from Canadian workmen, it is time to call a halt.

Overall market potential is relatively easy to measure. The company's share of the market is, however, more difficult to estimate. If the sources of information are good, the margin of error should not exceed five percent. As the forecast is broken down by product line, price or size group, and finally by individual items, accuracy decreases sharply.

Our company has six major divisions, each responsible to the vice-president in charge of sales. These divisions are:

1. Tires—original equipment.
2. Tires—replacement.
3. Auto parts and accessories.
4. Industrial products.
5. Chemical.
6. Plastic products.

These studies are lengthy and involved, but in essence are simply a series of income statements and balance sheets on forms with which you are familiar.

In the preparation of this study, each sales division manager is asked to supply:

1. Sales estimates broken down by months for the year.
2. Factors known or anticipated which may affect prices.
3. Factors known or anticipated which may affect unit volume.

The estimates consider market potential, company's share of potential; vehicle registration, company's potential per car; population, dollar potential per person; industry growth and company's ability to supply or expand to meet industry's requirements. Cost estimates entail the study of: basic material costs, labour increases, fringe benefit changes; production capacities, capital expenditures, overhead (fixed and variable); price trends of commodities not manufactured; production or volume variances. Gross income or loss developed flashes the signal for needed price or cost adjustments.

From this point, I should like to mention briefly the various other steps we take to produce our "available funds study".

1. *Capital expenditure projection*:—The expenditures approved but unspent for capital outlays, planned requirements, and future considerations, projected over a five-year period.
2. *Inventories*:—Each sales division established monthly inventory goals for one full year in advance. These estimates are checked as to turnover into sales, and judged on previous experience.
3. *Production estimates*:—Sales divisions are required to project their monthly production in units or pounds.
4. *Capital employed*:—We follow a standard formula for determining capital employed.

The available funds study in our company is a major control tool. Monthly comparisons are made by division of actual results versus projections of sales, cost of sales, commercial expense, operating income, and return on capital employed, and reconciliations of differences are prepared and studied. Actual inventory coverage on a monthly basis is measured against inventory goal coverage and existing variances are explained.

The study is released to senior officers, and extracts are furnished to applicable sales and manufacturing divisions. Background information from these studies becomes the basis for establishing and revising standard costs, sales quotas, and monthly operating budgets, and production levels. You can see why we label this a major control tool.

Break Even Charts

This is always an interesting study to make, but personally, I have had grave doubts as to its usefulness with multi-product commodity lines located in a single manufacturing plant such as our own, and with

many common facilities serving widely diverse manufacturing processes. As a practical matter, there is no single break-even point for a business with multiple product lines and we have felt dependent on other approaches. Much has been written on the subject and is readily available for reference.

If you are interested in this further for multiple lines, I would refer you to the N.A.C.A. Bulletin, November, 1955, where there is a very interesting and instructive article written by Paul A. May of Mine Safety Appliances Co. In the article, "break-even" charting is developed for the construction of a chart of ready reference to sales volumes, by several product groups which make up a company profit result, with provision for reading directly the effect of varying these volumes. In the article, the presentation of several sets of break-even data simultaneously to establish their relationship is outlined.

Mr. May develops the point that while no single break-even point exists for a business with multiple product lines, in actuality, a whole series of break-even points can be ascertained on an overall sales volume picture, depending first upon what facilities are used to achieve it and secondly, upon what product groups are used to create such sales volume. As with the break-even chart, there are many things to be looked into, and a considerable amount of detailed breakdown of volumes and expenses, if this method is to be effective.

I should like to quote Mr. May further. In fact, his concluding sentence reads: "The profit polygraph therefore affords a quick disclosure of specific courses of action, which can maximize profits while minimizing the time and effort spent in developing sound corporate objectives". If (And I have no real doubt) that is so, then here is a method with which we undoubtedly should familiarize ourselves.

Product Committees

I have covered briefly several different accounting tools in income analysis, but analysis by the accounting department is, of course, only one factor in determining success in a multiple product industry. New and better products and methods depend on the cooperation of all divisions. In our company, we have had some interesting experiences with group cooperative action.

The evolution of what we call our "product management committees" began with a serious problem in one of our divisions. We decided to call a conference of all the sales management group, production managers, technical managers, including those responsible for development, time-study and preliminary processing.

The problem of excessive costs and insufficient recovery at current selling prices was outlined. We began our discussion on how we could improve our selling prices and how we could reduce costs.

Through the combined efforts, advice and counsel of the sales, technical and production divisions, we arrived at a decision to close the department and to transfer manufacturing to another area where excessive labour cost was not a prime factor. We were frankly amazed to see how much progress could be made in the face of what seemed to be a hopeless situation. And we were delighted, that for once, everyone in both sales and production understood why we were taking this particular action. I refer, of course, to our decision to transfer footwear production from Kitchener.

Later still, the ever-increasing flood of imported rubber-soled canvas footwear from Hong Kong, forced us to discontinue the manufacture of rubber footwear altogether. In effect, the product committee on rubber footwear voted itself out of existence.

The "masterbatching" and further mixing are generally done in a common area for all end products. This area is known to us as "compounding or mixing" or more regularly as "mill room". Beyond this area, our wide diversification starts. Our great problem in footwear was labour costs. In our accounting, labour in mixing or mill department forms part of material cost. This, with processing labour, was developing an actual labour content in footwear of nearly 50% of total cost. Our record indicated this factor had risen steadily for each of the postwar years, and there were no indications that this rise could be halted. This was a major factor in our footwear decision.

Now any decision to increase or decrease output, cancel out or discontinue end product, has a very definite bearing on not only the assembly section but back to the primary production unit. The resulting reduction of compound due to discontinuance of product could and has had an effect on the cost of compound for other manufacturing areas.

Fortunately, our greatly expanded tire production, V-belt production, and new hose plant in Kitchener, largely mechanized, have replaced footwear and have absorbed the additional compound and other costs that otherwise would have developed.

Our success in finding an alternative to the unprofitable rubber footwear lines encouraged us to try the "team approach" to more of our sales, production and merchandising problems. We decided to set up small committees for all of our groups of products.

Representatives of production, technical and sales personnel on each committee were charged with the responsibility of producing an adequate return on capital employed in their group. We turn out literally hundreds of different products, each in many sizes and styles, from within our four walls, and the product committee approach is another means of determining the profitability of any particular product. I suggest that any manufacturing organization with a multiple product line would benefit from a similar plan.

Any division of our company that could be reduced to an operating income statement was the subject of our team approach. We selected a member of the sales force, not necessarily the manager but someone familiar with that product, the production head of that group of products, and the technical head of the product group.

We prepared for them a product statement showing sales for their line, operating income, return on capital employed, inventory investment, and sales and production forecasts. We outlined for them their responsibility and urged them to work together as a unit.

They work on mutual problems or reducing cost, improving quality without increased cost, or improving selling prices. They establish economical production schedules; set inventories. They add to inventory where necessary to increase sales requiring prompt delivery, and they reduce inventory when it is not needed.

They set their inventory goals and review constantly the margin sheets furnished them by Accounting for every item of importance in their production and sales activities. Every recommendation for expenditure for capital equipment is carefully weighed by this group before it is passed on by higher executives of the company for final approval or rejection.

Each committee has a chairman, chosen by the members of the committee. He may be a representative of sales, production or technical. The complete facilities of the accounting division and other staff divisions are available to them whenever they require help, and they do frequently call upon our sales and cost accounting groups.

In a sense, it is much like breaking down our company into a large group of individually managed companies. Out of this group of men, we expect to be able to draw, indeed already have drawn some men for improved position for the future growth of the company, because we are able to see which individuals can grasp the total responsibility concept most clearly and deal with it most effectively.

DISCUSSION

Question: For what periods of time do you issue a "Margin Sheet"—i.e., weekly, bi-weekly, or monthly?

Answer: We prepare Margin Sheets on an annual basis, unless a period of rapidly changing prices makes more frequent releases pertinent. We manufacture thousands of different items and the actual cost of preparing margin sheets is of course significant. Should pertinent changes in costs develop within a period, interim flash reports on a condensed basis are released. Margin sheets also provide an indicator of cost per unit in change in price of rubber, as you will note.

Question: Allocation of Overhead—Much of your organization for income analysis rests on the assumption that overhead is accurately

allocated. Do you review overhead allocations by departments or on a central company basis—e.g., Administration expenses?

Answer: This of course, is a very big subject. Many allocations can of course be made directly and accurately by department. Those of a general nature such as Administration Expenses must be reviewed on an overall Company basis. We recognize that many formulas exist for distribution of such an item as administrative expenses, but we feel that our cost of sales formula for general administrative expenses fits our particular company.

Question: In how much detail is your sales forecast made? i.e., by product line or in greater detail?

Answer: Our sales forecasts are made by product lines within the sales division. For example, I have mentioned that we have several major sales divisions. In sales forecasts, we break down these divisions into as many as twelve or more product groups within a single sales division.

Question: What basis do you use for the assignment of selling and G.A. expense to individual product, on your margin sheets?

Answer: Commercial expense percentage developed on actual Sales and Income statements by product groups is assigned to margin sheet items, after adjustments for special distribution methods, i.e., direct factory shipments, branch warehousing and class of customer.

Question: In calculating capital employed, how are assets common to more than one department distributed?

Answer: Generally, assets common to more than one department are distributed on weight of compound delivered to manufacturing departments. Actually, we get three distributions:

1. Power house, steam, electric.
2. Millroom.
3. Service departments.

But basis for each of these in our one plant is developed on end product use of facilities.

PERSONALS

L. H. Honess, a student member of the Toronto Chapter, has been appointed Cost Accountant with American Motors (Canada) Ltd., Mr. Honess was formerly with Canadian General Electric Company Limited.

W. E. Falconer, C.A., of the Montreal Chapter has been appointed Controller of The Gillette Safety Razor Company of Canada.

Stanley Butler, R.I.A., a past Chairman of the Hamilton Chapter, has been transferred to the parent firm of Wallace Barnes Co. Limited in Chicago.

Integrated Data Processing . . .

A Panel Discussion

Moderator:

D. B. WATSON, Director, J. D. Woods and Gordon, Toronto.

Panel Members:

H. S. BROWN, Assistant to Sales Manager, R. L. Crain Ltd., Ottawa.

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The following panel discussion is based on the paper "Integrated Data Processing" by H. S. Brown, published in the September 1956 issue of "Cost and Management." The discussion itself was presented at the 15th Annual Conference of the Society of Industrial and Cost Accountants at Windsor, Ontario in October 1956.

INTRODUCTION

By D. B. WATSON

BASICALLY, integrated data processing is the reduction of repetitious paper handling, by the integration of operations which previously were separate and independent processes. Now this covers a large field, and could be applied even to the use of carbon paper in the writing of correspondence, for instance, to eliminate the later copying of the original letter. It could also be applied to the peg board one-write system of payroll preparation or making carbon copies of cheques to save posting a separate cheque register. These are all examples of eliminating a later manual process by making it a part of the operation of preparing the original data.

For the last three years however, IDP has been considered by most people as embracing a rather more specific field, and confined to areas where key driven machines are used. For the purpose of our discussion therefore, we have defined IDP as: the process whereby the recording of original data is used to operate several subsequent mechanical processes, without further manual transcription, through the use of a common language.

The concept of IDP is not new, but the recent introduction of new machines has made it possible to an extent never before dreamed of, and feasible in large and small businesses of almost every kind.

In his paper Mr. Brown points out that the heart of an IDP system is the common language, which all machines in the system can read and/or produce. To-day that language is the five channel paper tape, because it is also acceptable to telegraph transmission circuits, and all IDP equipment is designed to handle that tape. This does not mean however that we have reached the ultimate in common language. Five channel paper tape has very definite disadvantages. Some people may

feel that the importance of being able to use telegraph lines for the transmission of tape is over-rated—even in this large country there are few places that are not served by overnight air mail, and this form of transmission is so cheap that in many cases the added advantage of immediate transmittal by telegraph line are not worth the great expense involved.

Advantages of I.D.P.

One interesting point brought out very clearly by Mr. Brown's paper is that IDP should be of as much interest to the small company as it is to the large. Whoever is thinking about IDP, it is likely to be for one or more of the following reasons:

Economy—Probably to be effected by a reduction of clerical staff, which is such an important factor in operating costs these days.

Accuracy—the reduction or elimination of errors may be so essential in some businesses, such as insurance, stock brokers, banks, etc. that it is of greater importance than any other factor.

Customer Service—in these days of extreme competition the service which can be provided to a customer in the prompt and accurate handling of an order can often be of paramount significance when designing an office system.

Greater Expediency—this can apply both to day-to-day paper work, and to the provision of information for control purposes.

Management Service—consisting of more accurate, and faster information to management so that business can be operated at maximum efficiency.

The members of the panel will be talking in more detail of how these aims can be achieved by means of integrated data processing—the only purpose in referring to them now is to indicate that reduction of clerical costs is not the only reason why you should be considering IDP.

The I.D.P. Principles

One of the objects of this panel is to attempt to remove from integrated data processing the all too common concept that it is something magical, extremely complex, and only suitable for the largest corporations. None of these things are true, and even less true is the idea that the machines involved are the most important factor. There is no doubt of course that the machines are important, and in fact much of what can be done to-day with IDP would be impossible if the equipment was not available. Nevertheless it is the principles of IDP which are the most important element of the system, and it is unfortunate that the principles tend to get overshadowed at times by the machine suppliers, who often over-emphasize the value of the equipment as equipment.

Before we start talking about how IDP operates therefore, let us be quite sure that we understand these principles, and that they are applied correctly.

Briefly, the principles of IDP can be defined as:

1. The original data is recorded at the point of origin in a form which is capable of being processed mechanically from thereon.
2. Once in this form the data is processed exclusively by mechanical means.
3. Data processing routines are integrated so that the original data in mechanical form is acceptable to all future operations.

We must realize also that while IDP is a form of work simplification, and exists for the same reasons that any other kind of work simplification does, individual components of the system may not be simple in themselves, and in fact may be quite complex, because of the number of simultaneous operations which occur. I am sure we can all agree that the overall result can still be work simplification in its full meaning.

I. A TEXTILE MANUFACTURER

By H. S. Brown

Our moderator outlined five reasons why an organization may be thinking about I.D.P. I'm going to briefly outline the present system in use by Canadian Cottons, and direct your attention to the areas of *greater expediency* and *management service.*

The System

But first, here's a run down of Canadian Cottons I.D.P. system. A hand written order is received in Head Office from the salesman. It is screened for coding, pricing, specifications, availability, etc. Proof sheets are typed on a closed circuit teletype. By using a unique "loop tape system" control codes are automatically introduced into the first by-product tape. The proof sheet is checked, and when "on line" time is available the órder is transmitted to the plant. At the receiving end of the circuit the production order is produced on a page machine. A by-product chadless tape is retained in the Invoicing Department in the mill where it is filed with a copy of the order. At Head Office a by-product of the order tape is passed through a Remington Rand Tape-to-Card Converter, where automatically punched cards are prepared for Order Analysis. In the plant, the tape filed in the Invoicing Department is pulled after shipment of the goods and used to write the invoices. A by-product tape is passed through the Tape-to-Card Converter and used for shipment analysis.

I.D.P. Speeds Up Service

In dealing with greater expediency there are three areas involved. In achieving higher rates of speed economies are also direct advantages resulting.

1. By teletyping orders to the mill regular flow is ensured, thereby relieving bottlenecks caused in the usual method of communication and getting the order into production up to two days earlier.
2. All orders flow regularly to the mill thereby eliminating need for separate despatch action relating to RUSH orders—and in many cases removing the category of RUSH.
3. Order Analysis and Shipment Analysis cards are available automatically on a regular basis through the use of a Tape-to-Card Converter. Expediency is a factor both in card preparation and verification, which is eliminated.

Quicker Reports to Management

In Management Service, I think you will see immediately that punched card analysis is available to Management at an earlier date, both in order and shipment phases of consideration. Decisions affecting plant operations, inventory status, marketing policies, etc., can be made while the facts are fresh.

All phases of the system as it will ultimately be have not yet been installed. But through the Paperwork Simplification approach, plans were laid out which would eventually allow for a maximum mechanization even to the input to a Univac Electronic Computer. As each segment of the system is absorbed by those personnel responsible for each stage of processing, then the next step will be taken. In this manner the I.D.P. system will be introduced in a way that will ensure a smooth continuation of the various functions of business.

II. AN AUTOMOBILE MANUFACTURER

By G. P. Powers

When our Oakville Assembly Plant was nearing completion in 1953, our Payroll Manager was assigned to select what he considered to be the most suitable payroll system to accommodate a 5,000 man payroll. Even though Ford of Canada has used punched cards for payroll and labour distribution for over 25 years, he gave the most careful consideration to the various methods available such as the one write method and the various key driven machines. As a result of this procedure research, it was determined, that for all the factors concerned the best method was punched cards—using a punched card calculator as the heart of the system. This method provided the best possibilities for improvement in light of the data processing equipment that was known to be on the way and it was cheaper than any other approach.

There is naturally a considerable amount of detail in the planning and operation of this payroll system. I shall endeavour however to stay away from the detail as much as possible and explain the basic system, which I hope may be of some assistance to you when you decide to study the various methods of performing the payroll function.

I believe I should mention that the common language in this instance is the punched card and in many cases it is mark sensed—you might quip that it is integrated with the rather old fashioned but still useful pencil, and that is how this procedure finds itself as a point of discussion by an I.D.P. panel.

The Master Record Card

The key to this payroll system as it is with many punched card procedures is a master record card. This card contains the information required about each employee in order that the mechanical system can compute his pay and print a pay cheque and pay statement.

It includes this information:

Badge number
Master number
Name and initials
Base hourly rate
Unemployment Insurance number
Seniority date
Tax exemption—annual and weekly
Labour classification
Bond deduction
Mortgage deduction.

This file is constantly brought up to date to record the various changes in the basic record.

The Employee Clock Card

The employee clock card is made from the master card by use of an end printing reproducer and an interpreter. During the reproducer operation sufficient of the master information is carried into the clock card to make it unnecessary to use the master card again for purposes of calculation. The clock card is a punched card form with the name, badge and master number printed on it and in addition it carries a punched pattern of information that will be used later on in the system. This card also has a mark sense area that performs quite an important function in the system.

On a daily basis the hours recorded on the clock cards are balanced with a Daily Departmental Report of Labour. This operation is also done at the week end to be assured of the necessary accuracy.

At the end of the pay period (this is a weekly payroll) the clock cards are checked, card for card against the master record for system security purposes. The clock cards are then sorted to pattern groups. We are not looking for exceptions as such but groups of clock cards that from the standpoint of hours worked and types of hours worked are the same.

One card for each pattern or group is key punched and this card is placed on top of the hourly pattern that it matches. These groups of

clock cards and pattern masters are fed through a reproducing punch that produces a payroll detail card.

The cards that do not fall into a pattern with other groups are mark sensed for the hours involved, fed through a reproducer that reads the pencil marks and produces payroll detail cards for the off pattern clock cards.

This last operation has placed on specially designed cards the information that the punched card calculator requires. These cards are then fed into a type 604 which computes and checks its own computations and arrives at net pay. Income tax is calculated at actual for the pay and no reference to the Income Tax Department chart is necessary.

The completed detail cards are sorted to department sequence and a complete payroll register is printed. Before starting the register printing the 407 is told the last cheque number used on the previous pay and it then allows a cheque number to each employee to receive a pay cheque.

Printing the Cheque

Until now cheques have been printed on continuous form. Commencing early in November a punched card cheque will be used.

The principle is this—the necessary information required to print the cheque and statements is punched by reproducer into the card cheque form—the cheque is passed through the interpretor, top side up, and the cheque information is printed. The card is turned over and passed through the same machine and the statement information is printed in the back.

Such a method apart from being rather slick, is welcomed by the bank who uses punched card equipment. They sort the cheques to sequence and print a reconciliation as part of their service. The payroll department ends up with a cheque that can be considered mechanical.

In addition to producing a cheque and register from the detail card the following records are also developed.

Accumulated Earning Card.
Bank Remittance Lists.
Cumulative Overtime Reports.

III. MAIL ORDER HOUSE

By M. F. Anderson

Integrated Data Processing, in one or more of its forms is the subject of intensive study in our company right now. I would like to be able to tell you of the radically new merchandising systems we are developing, but I can't as they are still incomplete. However, our company has had an installation of I.D.P. for nine years. Mind you, when it was started we didn't know we were in I.D.P., because the term had not been coined!

The Problem: Speeding Up Deliveries

The problem was this: We wished to provide next day delivery of orders taken in our many Sales Offices in cities as far from Toronto as Montreal and Ottawa. To accomplish this the merchandise had to be shipped on the same day as the customer placed her order.

Our normal method of recording the order and mailing it to Toronto, without the necessary filling and shipping, consumed the whole time available; so to eliminate this delay we started to teletype the order data immediately it was received. From the teletype output page we manually copied the necessary saleschecks. These were then inserted into the system and shipment was made the same day, and our primary objective of next day delivery was achieved.

Our customers were greatly impressed and the orders flowed in. Soon the lines were clogged and a large staff was engaged in transcribing to saleschecks. So large, in fact, that we were losing money on every sale!

The Five Channel Tape

To overcome this, a five channel tape transmission system was introduced. This overcame inefficiencies in originating operator speed, in that prior to the installation, lines capable of transmitting at 80 W.P.M. were wasted in transmitting at the operator's speed which could be anything from 10 W.P.M. up. Most of you are probably aware of how this works—the originating operator produces a tape off-line (that is *not* while transmitting), this tape is fed to the transmitter and transmits mechanically at full line speed. This enabled us to use two or more operators at the same transmitting station, or two or more stations on the same line.

We adopted this transmission system and extended it at the receiving end. Rather than print a page to be manually copied, we developed, with the Bell Telephone Company and R. L. Crain and Company, a series of saleschecks which could be automatically completed on teletype machines from a tape punched by the receiver.

Towards Greater Integration

This worked, and worked well, but I must confess that the additional potential of the tape escaped us completely. After the saleschecks were produced we consigned the tape to the waste paper basket.

We casually destroyed millions of digits of data that we copied and read from the saleschecks, countless times, to control inventory and to perform a multitude of accounting functions.

We were not altogether to blame. At that time such a tape would activate only a few other machines, and then only in a crude way—but now the tape is none other than a common language to many other machines which can perform many other functions.

Frankly we have not pursued this yet, because our other mechanization programmes are not sufficiently developed to use the tape effectively. But it takes very little imagination to forsee the production of all inventory and sales statistics from, say, punched cards produced directly from the tape.

To review this application let me point out that service was provided by the teletype that could not be touched in any other way and that the required economy was achieved through the integration, by machine, of the transmission and the salescheck production. I am sure that even greater economy and accuracy can be attained by subsequent additional integration.

DISCUSSION

Question: Volume seems to be inherent in all systems described, either volume of orders, customers, or employees. Is there any volume level that must be attained before I.D.P. becomes economically practical?

Answer: As was pointed out by the panel, volume is by no means the only criterion by which the desirability of I.D.P. in any particular situation should be judged. In many cases the greater accuracy or speed up in processing made possible by I.D.P. can be more important, and it is often a mistake to limit one's thinking to volume alone.

However, even when the volume of orders, customers, or clerical employees is being considered, there is no yardstick which allows you to say that I.D.P. is economically justified at any particular level. Every case is different, and must be studied carefully to determine the advantages to be gained, and the costs involved in obtaining them. It would be a very definite mistake to try to establish a level under which I.D.P. is not justified, and over which I.D.P. is automatically the answer.

Question: A company has done nothing about I.D.P. Where do they start?

Answer: If a company has done nothing about I.D.P. a fairly brief study should be made of all areas of record keeping and clerical work to determine those where advantages would be obtained if an I.D.P. system existed. Problems such as delays or errors in processing, multiple transcriptions, an excessive clerical force, or lack of timely management information and control should all be looked for during the course of this study.

When possible areas where I.D.P. might be of help have been decided upon, each should be looked at in considerable detail. A full methods study of the existing system, should be made, and the objectives of the system and the present shortcomings should be reviewed carefully. A suitable I.D.P. system should then be outlined, and its costs and the possible advantages and improvements over the existing system should be examined. The difficulties that may be introduced by I.D.P. should also be looked at. These might include any organiza-

tion changes which would be required, the retaining of personnel necessary, the effect on other phases of the business, etc.

Once all these facts are available for each area of accounting or record keeping selected, it should then be possible to make a decision whether or not I.D.P. is the answer. If I.D.P. is decided upon, the detailed equipment requirements, the exact procedures to be followed, and the installation timetable would remain to be worked out.

Question: All of the examples so far concern transmitting of information from or to outside locations. What is the application or advantage of I.D.P. in transmitting information within a plant at one location?

Answer: I.D.P. wire transmission inside a plant would usually be only desirable in a very large plant. However, the transmission of data by physical movement of the tape is one of the key values in any such programme.

Question: In the discussions on I.D.P. Inventory Control was not mentioned. Is not the cycle incomplete if the sales and purchase data cannot be used in a mechanized system of recording inventory status?

Answer: Inventory Control Input is certainly the logical completion of the cycle. It is, though, the most difficult aspect and should come as the last phase in introducing an I.D.P. plan. Many of the advantages of I.D.P. can be fully exploited before the cycle is complete.

Question: Will you please discuss further "pre-editing".

Answer: When data is to be perpetuated and used again and again from one originating activity it is imperative that a high degree of accuracy be maintained at that originating point. Pre-editing simply involves being positive that the source data is correct and that the originating activity is equally correct.

In effect it is the last manual check of the data, and it must be a good one. Verifying (in punch cards) is certainly often justified in perpetuated data input where it would not be in a one time use input.

Question: What resistance, if any, is there from office unions toward Integrated Data Processing I.D.P. programmes?

Answer: Although there are comparatively few companies in Canada with office unions where I.D.P. procedures are in use, I do not know why there should be any adverse reaction to this approach to office work if the principle of the use of machines in office work is understood. Although with the use of machines the trend is to fewer employees the work becomes more important with better pay. Usually with the increase and expansion that is taking place in business the number of employees does not decrease but rather a much larger volume of business is handled with the same number of people.

Question: Would 500 items daily to 50 customers be a practical billing application for I.D.P.?

Answer: It is important first to closely study the specific problem. Volume such as this may qualify as an I.D.P. application under certain circumstances (such as stock items where pre-punched tapes or cards for product description may be used), while other situations may not warrant the I.D.P. approach.

Question: Is an immediate saving the most important factor in considering an I.D.P. programme?

Answer: No, it is not. Other factors such as better customer service, quicker communications which may reduce inventory requirements, greater accuracy, are possibly the foundation for financial gains through progress.

Question: How difficult is it to implement an I.D.P. programme?

Answer: This is a broad topic. Briefly, it must be tackled with a planned approach. First, someone in the organization must possess authority to cut across departmental lines. Then comes a complete study of present procedure, followed by development of proposed methods. Keep in mind at all times the objective or end result desired. Once such a plan is formulated, equipment may be selected to handle the mechanization. The introduction of the new system to the worker is often the key to its success. As an individual he must support the new routine to ensure their continued success. Don't let us minimize the job though. Much work in the form of study and planning is needed to successfully implement the I.D.P. programme, but in the study phase above real advantages will result even before the I.D.P. system is adopted. Such advantages arise from the housecleaning caused through the paperwork simplification approach.

Question: How large a payroll would make a practical I.D.P. application?

Answer: It is difficult to use size alone as the criterion for mechanization of a payroll system. Payrolls range in complexity from the very simple hours X rate less static deductions to the very complex incentive systems that are prevalent in the electrical appliance industry.

Each particular situation requires careful study from the standpoint of reporting and cost and such study should provide a break even point for mechanization in the individual case concerned.

Question: Should we approach I.D.P. on a total or piece meal concept?

Answer: This again must depend upon circumstances, particularly the size of the system involved.

Generally speaking, it is quite often practical to mechanize the periphery of the overall procedure and in so doing develop accurate input for more advanced processing as experience in the system develops.

Student Section . . .

EXAMINATIONS, 1956

ADVANCED COST ACCOUNTING—PAPER I

Comments by George Moller, D. Jur., C.A., R.I.A.

QUESTION III (15 marks)

The Blue Rose Manufacturing Company produces a national brand item which it sells directly to customers. The price of this item, $12.50 per unit, has been long established and is regarded by consumers as the customary price.

Recently the business sector has been experiencing an overall decline in activity, and Blue Rose has been making sales at the rate of 5,000 units per month, or 40% of normal productive capacity.

The sales manager has been trying to increase volume, and he has received an offer from a department store chain. The chain is willing to buy 5,000 units per month, provided they are labelled as its private brand and are shipped and billed to its individual stores. The cost of packing and shipping would be absorbed by the chain, and it offers $7.00 per unit unpacked, on the basis of a one-year contract.

The sales manager feels this is a reasonable contract. He does not foresee a general improvement in business conditions within the next year, and he does not believe that the private brand will make any inroads in the sales of the national brand to consumers. Other executives, however, do not agree with him. They point out that the company is already losing money on its price of $12.50.

To put the discussion on an objective basis, you are handed the following data from the results of operations for the last month, and are told that during that month output was 4,000 units and sales 5,000 units, and are asked to furnish a report.

Manufacturing Costs

Direct labour	$ 9,900.00
Superintendent's salary	1,000.00
Assistant superintendent's salary	750.00
Power purchased	560.00
Direct materials	4,000.00
Purchased parts	2,400.00
Depreciation of building	1,420.00
Maintenance of building	206.00
Heat and light	348.00
Indirect labour	2,240.00
Miscellaneous supplies	800.00
Depreciation of machinery	3,640.00
Repairs to machinery	480.00
Property taxes	600.00
Insurance (fire)	80.00
Workmen's Compensation and Unemployment insurance	456.00
Miscellaneous	1,120.00
	$ 30,000.00

Selling Costs

Manager's salary	$ 833.00
Salesmen's commissions	18,750.00
Travel	247.00
Advertising	500.00
Clerical Salaries	300.00
Packing and shipping	2,108.00
Miscellaneous	1,204.00
	$ 23,942.00

Administrative and General Costs

Officers' salaries	$ 1,525.00
Office salaries	975.00
Telephone and telegraph	218.00
Supplies	486.00
Bad debts	625.00
Miscellaneous	393.00
	$ 4,222.00

REQUIRED:

Assuming that all items of cost are either completely fixed or completely variable, depending upon the usual dominant characteristic of each item and the data given herein, prepare a brief report, with supporting schedules, showing the results of accepting the department store's offer and contrasting this result with the profit if the offer is not accepted.

SOLUTION TO QUESTION III

The Blue Rose Manufacturing Company
Statement of Operations—Prospective

	Units Produced and Sold			
	4,000 units	5,000 units regular	5,000 units chain store	Total 10,000 units
Direct Material	$ 4,000	$ 5,000	$ 5,000	$ 10,000
Purchased parts	2,400	3,000	3,000	6,000
Direct Labour	9,900	12,375	12,375	24,750
Social security taxes	456	570	570	1,140
	16,756	20,945	20,945	41,890
Overhead expenses				
Variable				
Power purchased	$ 560			
Indirect labour	2,240			
Miscellaneous				
Supplies	800			
Repairs to machinery	480			
Total variable expenses	$ 4,080	5,100	5,100	10,200
	20,836	26,045	26,045	52,090

COST AND MANAGEMENT

	4,000 units	5,000 units regular	5,000 units chain store	10,000 units
Fixed				
Superintendent's salary	$ 1,000			
Assistant Superintendant's Salary	750			
Depreciation of building	1,420			
Maintenance of building	206			
Heat and light	348			
Depreciation of machinery	3,640			
Property taxes	600			
Insurance	80			
Miscellaneous	1,120			
Total fixed expenses	9,164	9,164	-0-	9,164
Total manufacturing costs	$ 30,000	$ 35,209	$ 26,045	$ 61,254
Unit cost	$ 7.50	$ 7.04	$ 5.21	$ 6.12
Sales @ $12.50	$ 50,000	$ 62,500		
$ 7.00			$ 35,000	$ 97,500
Manufacturing costs	$ 30,000	$ 35,209	$ 26,045	$ 61,254
Gross margin	$ 20,000	$ 27,291	$ 8,955	$ 36,246
Selling, administrative and general costs (see below)		$ 28,164	$ 2,083	$ 30,247
Net Profit or Loss*		$ 873*	6,872	5,999 Total
Selling costs				
Manager's salary		$ 833	-0-	$ 833
Salesmen's commissions		18,750	-0-	18,750
Travel		247	-0-	247
Advertising		500	-0-	500
Clerical salaries		300	-0-	300
Packing and shipping		2,108	-0-	2,108
Miscellaneous		1,204	1,204	2,408
Total Selling Costs		$ 23,942	$ 1,204	$ 25,146
Administrative and general costs				
Officer's salaries		$ 1,525	-0-	$ 1,525
Office salaries		975	-0-	975
Telephone and telegraph		218	-0-	218
Supplies		486	486	972
Bad Debts		625	-0-	625
Miscellaneous		393	393	786
Total administrative and general costs		$ 4,222	$ 879	$ 5,101
Total Selling, administrative general costs		$ 28,164	$ 2,083	$ 30,247

Note: Office salaries are assumed to be fixed since the organization is doubtless staffed for capacity operation.

These and other assumptions are somewhat arbitrary and subject to change depending upon facts not disclosed in the problem.

Any such reasonable assumptions were accepted.

COMMENT

The biggest stumbling block in this differential cost question was that many students failed to recognize that the actual production of 4,000 units was not the normal production and the costs involved could not be realistically used as a comparison. Once the student converted the 4,000 units into the normal production of 5,000 units, the differential comparison was very simple.

It was recognized that answers would vary depending upon the individual opinion as to whether an item was fixed or variable. Providing the student's selection was logical, he received full credit. It was not logical, however, to increase bad debts in the same proportion as the possible increase in sales in this problem.

The brief report requested in the question left a great deal to be desired in many cases and some students overlooked it altogether.

A few students converted the monthly figures given into annual figures. No penalty was given, but the students penalized themselves by spending unnecessary time on unwieldy figures.

QUESTION V (8 marks)

At the beginning of the month your company instituted a programme of product deletion, as a result of which all the so-called unprofitable products were deleted from the price list with effect from the first of the month. Profitability was determined by deducting from the sales price the estimated direct manufacturing cost of the product plus an allowance for non-manufacturing costs based upon a percentage of the sales value. Now, at the end of the month you find that more products have become unprofitable although there have been no changes in their prices or in the volume of their output.

REQUIRED:

(a) Explain briefly why more products have become unprofitable.
(b) Was the method of analysis used in this instance correct?
(c) Indicate briefly the information required before proceeding with a programme of product deletion.

SOLUTION TO QUESTION V

(a) The curtailment of products increased the amount of unabsorbed fixed cost which had to be covered by the remaining products.

(b) In such analysis, the direct manufacturing cost is the key to the solution. If the sales price yields any return in excess of the product's direct cost, such return helps to absorb fixed costs, both manufacturing and non-manufacturing.

Before any product is dropped from the company's line, the effect of overhead being presently charged to the product upon the net profits of all remaining products must be considered.

(c) 1. The following information by product:
   (i) Price
   (ii) Direct Cost
   (iii) Fixed cost absorbed per unit
   (iv) Output

2. New products available to take their place, with estimates for data listed in (1)

3. Feasibility of reducing facilities—
   (a) customer relations
   (b) effect on unit costs of remaining products.

COMMENT:

This question was not well answered. The major key to the solution was the analysis of costs into their fixed and variable portions. Some students missed this point altogether and misinterpreted the question by giving detailed descriptions of distribution cost allocation.

Most students limited their comments to the cost influences and omitted other factors involved such as customer relations, loss leaders and possible service problems, etc.

ADVANCED COST ACCOUNTING—PAPER II

QUESTION III (8 marks)

Your company is in the furniture manufacturing business. It follows the policy, whenever possible, of using the lowest grade lumber consistent with costs. The particular order under review involves a cutting of the following range of sizes: 35", 27", 21" and 15", the grade of the finished piece to be clear on one side.

Two grades of lumber are suitable for this order. If the cutting is made from No. 1 common lumber the wastage is 34%, if it is made from No. 2 common lumber the wastage is 42%.

The cost of lumber and of the direct labour involved in its conversion are as follows:—

Lumber

$165. per thousand feet kiln dried for No. 1 common.
$115. per thousand feet kiln dried for No. 2 common.
Lumber cut in an 8 hour day—
either 5,000 No. 1 common
or 4,000 No. 2 common

Labour

Labour cost per hour on the basis of an 8 hour day—$13 per hour.

Labour overtime cost per hour—time and a half.

REQUIRED:

Assuming there are sufficient orders to keep production running at normal capacity (no overtime) if the most efficient grade (minimum total cost) is always used, compute the saving on this particular order per thousand feet of net yield when the more efficient grade is used.

SOLUTION TO QUESTION III.

Conversion costs per day:

	Grade #1	Grade #2
8 hrs. @ $13.00	$ 104	$ 104
Cost of Lumber cut in one day:		
#1: 5000 feet @ $165/M	825	
#2: 4000 feet @ 115/M		460
Total costs per day	929	564
Net yield in one day:		
#1: 66% of 5000 feet	3300 feet	
#2: 58% of 4000 feet		2320 feet
Costs per 1000 feet of net yield:		
#1: 929: 3.300	$ 281.50	
#2: 564: 2.320		$ 243.10
Answer:		
More efficient grade is #2	281.50	
Savings per 1000 feet of net yield:		
$38.40	–243.10	
	38.40	

P.S.: The problem states:

". . . .There are sufficient orders to keep production running at normal capacity (no overtime) if the most efficient grade is always used . . ." and defines "the most efficient grade" as: "(minimum total cost)"

Therefore we have to assume that no overtime is required when using grade #2 lumber (minimum total cost).

COMMENT:

This was a very simple question and many candidates earned on it eight easy points. But a considerable number of students were unable to sort out data pertinent to the problem, from the information given in the text of the question, or could not cope with the computation of Net Yield, which was the clue to the solution. A surprisingly high percentage of candidates—9%—did not even make an attempt at this question.

Less than 61% of available points were earned.

ACCOUNTING I.

QUESTION VI (10 marks)

On January 2, 1953, the Acme Company purchased a new delivery truck for $3,600. It was depreciated on a straight line basis, with an estimated life of three years. On January 2, 1955, the com-

pany acquired a new truck costing $3,900. They paid for this truck by trading in the old one, paying cash $1,000 and a note payable $2,500. The new truck was then sold on January 2, 1956, for a cash price of $3,000. Depreciation had been provided for it on the same basis as for the first truck.

REQUIRED:

Give the general journal entries at January 2, 1955 and January 2, 1956.

SOLUTION TO QUESTION VI.

Comment by C. C. Gourlay

January 2, 1955.			
Truck	$ 3,900		
Accumulated Depreciation	2,400		
Loss on disposal of truck	800		
Cash		$	1,000
Note payable			2,500
Delivery			3,600
To record the trade-in of 1953 delivery truck.			
January 2, 1956.			
Cash	$ 3,000		
Accumulated depreciation	1,300		
Truck			3,900
Profit on disposal of truck			400
To record sale of 1955 truck.			

COMMENT:

Many students had trouble handling this question. It was obvious that too many of them failed to picture what the accounts in the ledger looked like before and after the transaction. The use of rough "T" accounts would have solved this problem.

ACCOUNTING II

Comments by Prof. J. D. Campbell

QUESTION V (12 marks)

A Company Limited in evaluating its inventories for statement purposes has been changing the bases over the past five years and by this method has succeeded in equalizing the reported profits of the company.

The following data are available for the past five years:

	1951	1952	1953	1954	1955
Profit reported	$125,000	$126,200	$125,500	$124,600	$128,000
Basis of valuation of inventories used	Retail	Fifo	Lifo	Average Cost	Lower of cost or mkt.

Inventory value—					
Retail	$850,000	$900,000	$520,000	$350,000	$1,000,000
Fifo	610,000	700,000	300,000	215,000	720,000
Lifo	540,000	500,000	250,000	200,000	640,000
Average Cost	600,000	550,000	275,000	210,000	675,000
Lower of cost or market	620,000	520,000	290,000	300,000	820,000

REQUIRED:

1. Comment on the action of management in the above case giving DUE consideration to generally accepted accounting principles.

2. Indicate the basis of inventory valuation which you would choose, and on that basis recompute the profits of the company for the years 1952, 1953, 1954 and 1955.

SOLUTION TO QUESTION V.

1. The equalization of reported profits through a change in the bases of evaluation of inventories by management is unacceptable if the purpose of the statement is to reflect a true presentation. It violates the concept of consistency and may reflect non-conservatism if the trend of the revised profits are declining. The procedure followed is essentially an averaging procedure and, therefore, has the essential drawbacks of an average figure where trends prevail.

2. The basis of inventory valuation to be chosen should reflect the above comments. The lower of cost or market will be accepted although the student should indicate the drawbacks of this method.

3.

	1952	1953	1954	1955
Retail	$326,200	$195,500	$ L. 5,400	$168,000
Fifo	366,200	175,500	79,600	23,000
Lifo	236,200	325,500	114,600	L. 42,000
Average	226,200	300,500	99,600	L. 17,000
Market	176,200	345,500	174,600	38,000

COMMENT:

Only a small portion of the students completed correctly the (b) division of this question. The failure in this respect indicated that the student did not realize that the variations in both the opening and closing inventories affected the profit reported. In a number of cases it was evident that the student had not interpreted the information given in the question correctly.

The answers submitted to the (a) division of the question were satisfactory. Where the student chose a specific basis of valuation credit was given providing the choice was supported by adequate reasoning.

COST AND MANAGEMENT

CORRECTIONS

EXAMINATIONS, 1956

ACCOUNTING I

October issue: Question VIII

In Part (a) journal entries were given. Actually, no journal entry was required as the books of original entry and the general ledger already showed correct balances. Only the credit to the subsidiary ledger was necessary.

November issue: Question II

(a) Journal entry No. 9 should read:

9.	Real estate taxes expense	413.33	
	Real estate taxes payable		413.33
	To set up liability and record expense for one months taxes $\frac{1240}{3} = 413.33$		

(b) Should read:

Corrected Profit and Loss

Balance		$18,757.50
Add	$ 350.00	
	450.00	
	450.00	
	28.20	
	6.96	
	300.00	
	2,700.00	
		4,285.16
		23,042.66
Deduct	16.44	
	825.00	
	413.33	
		1,254.77
		$21,787.89